intended for elementary students is really an offence. We recommend the remarks of Boulenger ("Tailless Batrachians of Europe," Ray Society, p. 301) to the author.

MODERN ORGANIC CHEMISTRY.

Recent Advances in Organic Chemistry. By Dr. A. W. Stewart. With an introduction by Prof. J. N. Collie. Pp. xv+296. (London: Longmans, Green and Co., 1908.) Price 7*s.* 6*d.* net.

UNLESS the chemist, and especially the organic chemist, adopts some elaborate system of grouping together new information as it appears, the mass of research which nowadays floods the journals makes it difficult for him to keep abreast of current investigations.

The reports of the British Association on organic chemistry have served a most useful purpose in giving summaries of recent work; but they are too few in number. It appears to us that if the Association's funds could be utilised in extending this part of its activities, they would be well spent. Three or four reports a year on different branches of chemistry would be invaluable. But until we have something of this kind we must rely on individual effort to supply the want. This, we take it, is the main object which Dr. Stewart had in view in writing his book, and we congratulate him on the result, which has taken the form of a compact, neatly bound and well-printed volume at a very moderate price. The compilation has been carried out with great discrimination. It is not an easy matter to discuss details of modern structural formulæ and at the same time to sustain the interest of the reader. But Dr. Stewart has an easy and pleasant style, and, if his criticisms are occasionally rather forcible, they only add piquancy to the subject under discussion.

We think the author takes too despondent a view of the present trend of organic chemistry. We are, it is true, deluged with new compounds, which seem destined to bear no fruit, but the worst that can be said of them is that they add to the bulk of our already ponderous journals.

Nor are we of the author's opinion in thinking that "we have accumulated an immense mass of data concerning the results of reactions, but very little indeed with regard to their causes." The very volume before us serves to negative the statement, for the book bristles with facts upon which theories are based.

We do, however, most heartily agree with him in emphasising the need for studying exceptions to general theories, and there is no doubt that therein lies a fruitful field of study. Our knowledge of the mechanism of most, even of the simplest, reactions is incomplete. We know the end result, but not the intermediate steps. Moreover, there is scarcely any general reaction which is not modified to some extent in its individual applications, whereby we are forced more and more to recognise reactivity as a function of environment. But surely this is no cause for discouragement. There are still new worlds to conquer, and perhaps Dr. Stewart's book may induce chemists to give their attention to these neglected problems.

That the author appears a little impatient of those whose attitude towards new theories is hesitating, and perhaps conservative, is perhaps natural. But it must be remembered that our mechanical concepts of atomic relations are not easy of proof, and dynamical concepts much less than statical ones. Van 't Hoff's theory has afforded overwhelming evidence of the value of the statical idea, for it is the very essence of stereochemistry, and fits in admirably with the theory of atomic linking and the existence of dynamic isomers. The foundations of organic chemistry are laid on a statical basis. It is only natural, therefore, that the explanation of the physical properties of compounds should bear a direct relation to this fundamental idea. No one doubts that the statical concept is an incomplete one. It is equally certain that the whole story of molecular forces will only be known when physical and chemical properties are grouped under one comprehensive idea. But there is no reason why new theories should not be grafted on the old, deep-rooted stock, until it may be safely transplanted. We must only be sure that any theoretical development is capable of experimental study, and in this connection it is doubtful if electrons and Faraday tubes, whatever theoretical value the physicist may attach to them, will prove more serviceable to the organic chemist than vortex atoms.

The book is divided into chapters or essays dealing with those topics which have attracted special attention during the last decade. It opens with a good general account of Grignard's reaction and asymmetric synthesis. Then follows a chapter on polyketides, that is, bodies containing the $CH_2.CO$ or ketene group or its multiple, which is illustrated from the work of Collie, Staudinger, and Wilsmore. This is followed by a chapter on recent synthetic preparations of *cyclo*paraffins, which the author terms "polymethylenes." There are essays on recent work on the terpenes, alkaloids, and polypeptides. An interesting, though a very brief, account is given on the action of light on organic compounds which embodies much of the work of Ciamician and Silber, and there are chapters on addition reactions and unsaturation, in which the author has something to say about his own investigations. The volume closes with a chapter touching on modern views and the inadequate nature of structural formulæ, and there is, finally, an excellent bibliography of organic chemical literature, which affords convincing testimony of the utility, if not necessity, to all organic chemists of an adequate knowledge of the German language.

J. B. C.

THE CURVATURE METHOD OF TEACHING GEOMETRICAL OPTICS.

Geometrical Optics. By V. H. Mackinney and H. L. Taylor. Pp. iii+128. (Birmingham: J. and H. Taylor.)

THE preface to this little book is somewhat misleading. We there read:—"The growing demand for a book on Geometrical Optics based upon the Curvature system has led to the production of this small volume. . . ." If the use of the curvature

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method constituted the chief characteristic of the book, we should have but little to say in its favour. The curvature method undoubtedly possesses many obvious advantages, but the loose and in places quite inaccurate manner in which the elementary theory of mirrors and lenses is here set forth does much to obscure the merits of the system.

The definition "The curvature of a circle is the angle through which a curve turns per unit length" gives an early suggestion of the lack of logical clearness which is throughout apparent. As an instance of more serious inaccuracy the following attempt at an explanation of the formation of an image by a concave mirror may be quoted (p. 18):—

> "To explain the formation of the virtual erect image we may imagine the mirror to consist of an infinite number of plane surfaces (Fig.). Each of these is capable of producing a virtual and erect image (as previously explained) identical in position behind the mirror with the object in front. As the object is moved from the mirror more of these supposed innumerable facets take up the reflection for the eye to view, and so the image increases rapidly in size. . . ."

The attempt at a formal proof, for the spherical mirror, of the relation connecting conjugate foci is given later (p. 38). With no guidance as to the conditions limiting the truth of the statements made, and with a misleading figure, we venture to think that the intelligent student would find this hopelessly bewildering.

In fact, however, no real attempt is made to establish, by the curvature method, the principles of elementary geometrical optics. Apart from the statement in the preface one would have judged the aim of the book to be quite different from this. It would appear clearly to be intended for the use of those actually engaged in optical workshops, and especially those concerned with the practice of spectacle making and of sight testing. It would seem to aim, not at providing a logical exposition of elementary principles on any system, curvature or other, but at furnishing a reader of the kind suggested with a sufficient modicum of information about many points likely to be brought under his attention in the course of his practice, to enable him to deal with these not unintelligently. From this point of view it may fairly be held to have achieved some measure of success. Evidently written by practising opticians, it does contain, in small compass, a good deal of practically useful and important information not to be found in the ordinary elementary text-book, more especially in regard to the characteristics of the eye as an optical instrument and the problems involved in the correction of its defects. The fact that the discussion of such questions is more readily carried on in terms of curvatures and focal powers than of radii of curvature and focal lengths may, perhaps, be held to account in some measure for the sentence quoted from the preface.

The book has some features of value to those for whom quick reference is essential: a useful summary at the end of each chapter; a few tables and data, including a table of aberrations in lenses and their remedies, from a paper read by Prof. Silvanus Thompson before the Optical Society; a list of optical works; and, following the index, a list of articles useful in spectacle work and sight testing, with approximate prices.

As a text-book on elementary optics the book needs much careful revision. We think well enough of it to express the hope that it may receive this treatment without delay.

ECONOMIC ZOOLOGY.

Economic Zoology, an Introductory Text-book in Zoology, with Special Reference to its Applications in Agriculture, Commerce and Medicine. By Prof. Herbert Osborn. Pp. xv+490; 269 figures. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1908.) Price 8*s.* 6*d.* net.

A Manual of Elementary Forest Zoology for India. By E. P. Stebbing. Pp. xxiii+230+xxxiv; 422 figures. (Calcutta: Superintendent Government Printing, 1908.) Price 15*s.*

THE teacher of zoology to students whose chief interest in the science depends upon its relations to some branch of human industry has often to decide whether he shall give the more prominent place to general principles or to special and technical applications. The rival points of view are well illustrated in these two works. Prof. Osborn, in the introduction to his handy "text-book," rightly advocates the claims of sound general principles.

> "Inasmuch," he writes, "as economic zoology is simply an application of our knowledge of animals which affect human interests, it is easy to see that almost any phase of the study will have some bearing on the problems that concern us. Economic zoology, if studied thoroughly, must of necessity be based on accurate knowledge . . . so that it involves a study of the whole animal and all that can be learned regarding its activities."

In agreement with these principles, the author has, in the work before us, neglected no groups of the animal kingdom, even though, like the Echinoderms and the lower Chordata, they have little or no "economic" importance, so far as we know at present. A knowledge of the structure of these groups is essential to any real training in zoology; and who, a dozen years ago, could have foreseen the vast economic importance of such groups as the Hæmosporidia, the Culicidæ, and Ixodidæ? The students now in our colleges require training not only for the known needs of the present; they are entitled to be equipped so that they can grapple practically with the unknown problems of the future.

But while the principles that have guided Prof. Osborn are thoroughly sound, it is doubtful if he has made the best possible use of the space at his disposal in thus applying them. He has given clear descriptions of the great animal phyla from Protozoa to Vertebrata, and the leading classes and orders, illustrated by well-chosen figures culled from trustworthy sources. Such descriptions are, however, already available in many zoological text-books. The special text-book for the student of economic zoology should

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